

COVID-19 CT Image Synthesis With a Conditional Generative Adversarial Network

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Abstract

Coronavirus disease 2019 (COVID-19) is an ongoing global pandemic that has spread rapidly since December 2019. Real-time reverse transcription polymerase chain reaction (rRT-PCR) and chest computed tomography (CT) imaging both play an important role in COVID-19 diagnosis. Chest CT imaging offers the benefits of quick reporting, a low cost, and high sensitivity for the detection of pulmonary infection. Recently, deep-learning-based computer vision methods have demonstrated great promise for use in medical imaging applications, including X-rays, magnetic resonance imaging, and CT imaging. However, training a deep-learning model requires large volumes of data, and medical staff faces a high risk when collecting COVID-19 CT data due to the high infectivity of the disease. Another issue is the lack of experts available for data labeling. In order to meet the data requirements for COVID-19 CT imaging, we propose a CT image synthesis approach based on a conditional generative adversarial network that can effectively generate high-quality and realistic COVID-19 CT images for use in deep-learning-based medical imaging tasks. Experimental results show that the proposed method outperforms other state-of-the-art image synthesis methods with the generated COVID-19 CT images and indicates promising for various machine learning applications including semantic segmentation and classification.